CLAIMS

- 1 1. A method of forming a ceramic body with nanostructures on at least one surface
- 2 thereof, the method comprising:
- 3 (a) compressing ceramic particulate at a pressure sufficient to form a solid body;
- 4 (b) sintering the solid body at a temperature and for a period sufficient to bond the
- 5 particulate in the solid body into one or more ceramic crystals;
- 6 (c) exposing the solid body to a reducing environment at a temperature and for a
- 7 period sufficient to form nanostructures on at least a portion of the exterior
- 8 surface of the solid body.
- 1 2. The method in accordance with claim 1, wherein the ceramic particulate further
- 2 comprises titania.
- 1 3. The method in accordance with claim 1, wherein the reducing environment further
- 2 comprises a hydrogen-containing gas flowing over the solid body at a sufficient gas flow
- 3 rate to form said nanostructures.
- 4. The method in accordance with claim 1, wherein said pressure is greater than about 0
- 2 MPa.

- 5. The method in accordance with claim 1, wherein said pressure is about 400 MPa.
- 1 6. The method in accordance with claim 1, wherein the step of sintering is carried out at
- 2 a temperature of less than 1,400 degrees Celsius.
- 7. The method in accordance with claim 6, wherein the step of sintering is carried out at
- 2 a temperature of about 1,200 degrees Celsius.
- 1 8. The method in accordance with claim 7, wherein the step of sintering is carried out for
- 2 about 6 hours.
- 1 9. The method in accordance with claim 3, wherein the hydrogen-containing gas further
- 2 comprises a majority inert gas and a minority hydrogen-containing gas.
- 1 10. The method in accordance with claim 9, wherein the hydrogen-containing gas is
- 2 hydrogen.
- 1 11. The method in accordance with claim 9, wherein the hydrogen-containing gas is
- 2 water.

- 1 12. The method in accordance with claim 9, wherein the step of heat treating is carried
- 2 out at a temperature of about 700 degrees Celsius.
- 1 13. The method in accordance with claim 12, wherein the step of heat treating is carried
- 2 out for a period of about 8 hours.
- 1 14. The method in accordance with claim 1, wherein the step of heat treating is carried
- 2 out at a flow rate between about 100 and about 500 milliliters per minute.
- 1 15. The method in accordance with claim 14, wherein the flow rate is at least about 500
- 2 milliliters per minute.
- 1 16. The method in accordance with claim 1, wherein the nanostructures formed further
- 2 comprise nanofibers.
- 1 17. The ceramic body produced according to the process of claim 1.
- 1 18. A method of forming a metal oxide body with nanostructures on at least one surface
- 2 thereof, the method comprising:
- 3 (a) compressing metal oxide particulate at a pressure greater than 0 MPa to form a
- 4 solid body;

- 5 (b) sintering the solid body in air at a temperature of less than 1,400 degrees
- 6 Celsius; and then
- 7 (c) heat treating the solid body in a gas mixture containing a majority of an inert
- 8 gas and a minority of a hydrogen-containing gas at a gas flow rate, a temperature
- and for a period sufficient to cause nanostructures to form on at least a portion of
- the exterior surface of the solid body.
 - 1 19. The method in accordance with claim 18, wherein the nanostructures formed further
 - 2 comprise nanofibers.
 - 1 20. The method in accordance with claim 18, wherein said pressure is about 400 MPa.
 - 1 21. The method in accordance with claim 18, wherein the step of sintering is carried out
- 2 at a temperature of about 1,200 degrees Celsius.
- 1 22. The method in accordance with claim 21, wherein the step of sintering is carried out
- 2 for about 6 hours.
- 1 23. The method in accordance with claim 18, wherein the inert gas is nitrogen.

- 1 24. The method in accordance with claim 18, wherein the hydrogen-containing gas is
- 2 hydrogen.
- 1 25. The method in accordance with claim 18, wherein the hydrogen-containing gas is
- 2 water.
- 1 26. The method in accordance with claim 18, wherein said gas flow rate is between
- 2 about 100 and about 500 milliliters per minute.
- 1 27. The method in accordance with claim 26, wherein the gas flow rate is at least about
- 2 500 milliliters per minute.
- 1 28. The method in accordance with claim 18, wherein the step of heat treating is carried
- 2 out at a temperature of about 700 degrees Celsius.
- 1 29. The method in accordance with claim 28, wherein the step of heat treating is carried
- 2 out for a period of about 8 hours.
- 1 30. The metal oxide body produced according to the process of claim 18.

- 1 31. A method of forming a titania body with nanofibers on at least one surface thereof,
- 2 the method comprising:
- 3 (a) compressing titania particulate at a pressure of about 400 MPa to form a solid
- 4 body;
- 5 (b) sintering the solid body in air at a temperature between about 1,100 and about
- 6 1,400 degrees Celsius for about 6 hours; and then
- 7 (c) heat treating the solid body in gas containing about 95 percent inert gas and
- 8 about 5 percent hydrogen with a gas flow rate between about 100 and about 500
- 9 milliliters per minute and a gas temperature of about 700 degrees Celsius.
- 1 32. The method in accordance with claim 31, wherein the step of sintering is carried out
- 2 at a temperature of about 1,200 degrees Celsius.
- 1 33. The method in accordance with claim 31, wherein the flow rate is at least about 500
- 2 milliliters per minute.
- 1 34. The titania body produced according to the process of claim 31.
- 1 35. A titania solid body having a plurality of fibers on the surface thereof, said fibers
- 2 having a diameter in a range from about 15 nanometers to about 50 nanometers.

- 1 36. The titania solid body in accordance with claim 35, wherein the titania is the rutile
- 2 phase.
- 1 37. The titania solid body in accordance with claim 35, wherein the solid body contains a
- 2 plurality of titania crystals.
- 1 38. The titania solid body in accordance with claim 35, further comprising a pair of
- 2 electrically conductive bodies having opposite electrical polarity mounted to the body.
- 1 39. A sensor comprising:
- 2 (a) a titania solid body having a plurality of fibers on the surface thereof, said
- fibers having diameters in a range between about 15 and about 50 nanometers;
- 4 and
- 5 (b) a resistance measuring means electrically connected to the solid body.